

**METHODS AND SYSTEMS FOR MODEL REDUCTION AND SYSTEM  
IDENTIFICATION OF DYNAMIC SYSTEMS WITH MULTIPLE INPUTS**

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**ABSTRACT OF THE DISCLOSURE**

Methods and systems for model reduction and system identification of dynamic systems are disclosed. In one embodiment, a method includes generating a plurality of statistically independent random numbers for use as input signals, and performing a singular-  
10 value-decomposition directly on the system response due to a simultaneous excitation of the plurality of input signals. Alternate embodiments further includes sampling individual pulse responses for the first two time steps, and constructing Hankel-like matrices from which the state-space system matrices (**A, B, C, D**) are obtained. Since the system response is sampled almost exclusively for the single representative input, the model construction time is  
15 significantly reduced, especially for a large-scaled dynamic systems. The plurality of input signals may be filtered through a low-pass filter. Alternately, the plurality of input signals may also include applying multiple step inputs in a sequential manner, and applying multiple pulse inputs in a sequential manner.

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